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paragraphs (5) and (6) following. Detailed and permanent records of these tests shall be kept by the manufacturer and copies immediately furnished to the commission.

(5) The total arsenic content of the air-dried drug shall not be below 29.5 or above 31.57 per cent.

(6) The maximum tolerated dose for healthy albino rats shall not be below 50 mg. per kilo body weight when a 2 per cent slightly alkaline solution of the drug in freshly glass-distilled water is injected into the saphenous or tail vein of the animals at the rate of not more than 0.5 c. c. per minute.

For each toxicity test a series of animals of not less than four shall be used and at least 75 per cent of the animals injected with the maximum tolerated dose should survive 48 hours from the time of injection.

The rats shall not be anesthetized for the injection and shall weigh between 100 and 150 gm. Pregnant animals shall not be used.

(7) In addition to tests by the manufacturer, tests shall be made from time to time by the United States Public Health Service. For this purpose, samples of each lot shall be forwarded by the manufacturer to the United States Public Health Service, and officers of said service or of the Federal Trade Commission, when duly detailed, may enter establishments for the purpose of securing samples and conducting inspections. The number of samples supplied shall be not less than 10 ampules from any lot, and from lots of over 1,000 ampules, 1 per cent shall be furnished.

(8) When lots have passed satisfactorily the prescribed tests, they may be offered for sale, but the right is reserved to require the withdrawal from the market of any lot designated by the Federal Trade Commission.

(9) Manufacturers shall retain 5 per cent of the ampules from each lot for a period of three months from the time the preparation is put in ampules.

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## APPROPRIATIONS FOR CITY HEALTH DEPARTMENTS.

### SUMMARY OF EXPENDITURES OF 330 CITIES IN THE CENTRAL AND EASTERN UNITED STATES FOR PUBLIC HEALTH WORK

By PAUL PREBLE, Passed Assistant Surgeon United States Public Health Service.

Under the act of Congress of August 14, 1912, which authorized studies of conditions affecting diseases of man, the United States Public Health Service began, in July, 1913, extensive laboratory and field investigations upon two large watersheds, the Ohio and Potomac Rivers, to determine the effects of stream pollution upon the health of the communities located in these drainage areas.

In addition to elaborate and extensive laboratory studies, continued to about July, 1917, special epidemiological study was given to the communities located upon the Ohio drainage area in order to secure as accurate record as possible not only of the effect of stream pollution upon these communities, but of the organizations established for the protection of public health, their activities and efficiencies.

Sanitary surveys of the Ohio watershed communities were begun in May, 1914, and included all towns and cities of any importance located on the watershed in the States of New York, Pennsylvania, Ohio, Indiana, Illinois, Kentucky, Virginia, West Virginia, Tennessee, North Carolina, and Alabama. During the next three years these surveys were extended to the eastern States of New Hampshire, Vermont, Rhode Island, Connecticut, New York, and New Jersey.

In these States all towns and cities having populations of about 8,000 or over were visited by field parties consisting of a medical officer and a sanitary engineer.

In concluding these sanitary surveys, the basis of judgment as to the effect of stream pollution upon the communities studied has been the prevalence of typhoid fever. Local municipal health departments were interviewed, and their organization, activities and efficiency noted in each instance.

From the data thus accumulated it is apparent that rather interesting and valuable comparisons and tabulations can be drawn from a fairly extensive and representative group of towns and cities. Notes were taken concerning public-health organizations and their activities, and a method of rating was devised for the various functions on the basis of a valuation of the measures taken to prevent the occurrence and spread of typhoid fever.

From the records of the communities covered by sanitary surveys it has been possible to abstract quite accurate data concerning the gross expenditures made for public-health work. This data has been compiled by population groups and is given in Table No. 1.

#### **Difficulties in Comparing Health Departments.**

Attempts to compare health departments generally fail because there is no real standard or measure of comparison that can be universally applied. Mere statements of moneys appropriated or expended mean very little unless it is possible to apply a rather complete analysis of organization, function, activity, and rated efficiency. Health departments in cities of different size will be found to have different functions related to public-health work. The larger cities and those economically prosperous and abreast of the times will usually provide laboratory facilities, medical inspections of schools, and tenement-house inspection, and maintain hospitals for the isolation and care of communicable diseases. Smaller cities, as a rule, do not provide funds sufficient for these activities.

As it was necessary to collect certain of the data secured from printed reports, it seems pertinent here to point out and emphasize the fact that there is a striking lack of uniformity in annual reports published by health departments generally. Many of the larger printed reports are verbose and replete with data that can not be used for purposes of comparison with data from other cities. Smaller cities and towns frequently publish only a page or two concerning health activities in the annual municipal report, and give no really valuable information concerning the organization or the activities undertaken. Many of the reports studied give no idea of the various functions assumed or of the items of expenditures to be credited to public health work. Pauper care, hospitals and institutions, garbage

and waste disposal, plumbing inspection, and even street cleaning, are frequently taken over by health departments.

In attempting to compare expenditures made for health purposes, it is obviously necessary to compare similar items or gross allotments covering similar functions. It is difficult and practically impossible in some instances to apply any comparison between expenditures of different departments for the reason that statements of expenses are frequently not itemized and different departments perform different functions. Fiscal year periods vary, but this fact does not materially affect comparisons of yearly expenditures.

In presenting the data included in Table 1, absolute accuracy for the figures taken to form the various group totals is not claimed because of the difficulties already mentioned. It is believed, however, that the aggregates for the different groups are quite representative of average expenditures for the groups. The fiscal year periods vary for individual cities, but the populations used correspond always with the period for which the expenditures were obtained.

TABLE 1.—*Health department expenditures per capita by size groups with average sanitary ratings and typhoid death rates.*

Cities having populations of—	Number of cities.	Aggregate populations.	Aggregate gross expenditures, health department.	Expended for waste disposal, etc.	Balance expended for public health work.	Average population of city for group.	Average annual group expenditure per capita.	Average sanitary rating for group.	Average typhoid death rate per 100,000.
<i>Thousands.</i>							<i>Cents.</i>		
(1) 0-5.....	82	167,646	\$15,600.21	\$696.00	\$14,904.21	2,045	9.1	52.3	31.6
(2) 5-10.....	56	434,866	55,218.50	2,951.83	52,266.67	7,767	12.0	61.6	31.1
(3) 10-20.....	99	1,396,087	280,167.85	40,713.69	239,454.16	14,000	16.8	69.8	22.6
(4) 20-25.....	26	573,351	136,887.67	16,825.30	120,062.37	22,090	20.6	70.9	23.3
(5) 25-50.....	33	1,134,637	429,770.82	143,410.00	286,360.82	34,383	24.6	73.0	22.1
(6) 50-100.....	16	1,108,469	323,124.08	36,286.81	286,837.27	69,279	25.7	76.5	13.9
(7) 100-300.....	18	2,491,761	1,149,637.22	166,131.06	983,506.56	138,431	39.1	80.8	17.9
Total.....	330	7,296,917	2,390,406.35	407,014.69	1,983,392.06	22,112	27.2	66.7	20.1
Average city.....		22,112	7,243.65	1,233.37	6,010.28		22.7	66.7	20.1

TABLE 2.—*Salaries of health officers.*

Cities having population of—	Number of cities.	Aggregate population.	Total salary health officers.	Average salary health officers.	Average size city.
0-5,000.....	74	150,468	\$9,471.00	\$127.94	2,033
5-10,000.....	54	412,573	22,499.50	416.65	7,640
10-20,000.....	97	1,345,901	64,938.71	669.47	13,875
20-25,000.....	26	576,015	27,005.50	1,038.67	22,154
25-50,000.....	35	1,196,586	41,715.00	1,191.86	34,188
50-100,000.....	18	1,259,399	32,150.00	1,786.11	69,966
100-300,000.....	16	2,129,476	38,935.00	2,433.44	133,082
Over 300,000.....	1	389,106	5,000.00	5,000.00	389,106

In a certain number of the cities included in Table 1 the gross expenditures given included money expended for such purposes as garbage disposal and other activities not properly functions of a health department. These items have been separated and deducted in order to obtain a "balance expended for public-health work."

The final figure for comparison is that showing the average annual group expenditure per capita obtained by dividing the aggregate group expenditure by the aggregate group population.

As might be expected, the smaller towns and cities generally make smaller per capita expenditures than larger cities. The average per capita expenditure varies fairly directly with the size of the community.

Of the communities having populations under 5,000, about 150 were surveyed and fairly accurate data secured for the 82 included in group 1. Expenditures per capita in this group varied from approximately nothing to 79 cents, with an average of 9.1 cents.

In this size community public-health work was found to be practically neglected as a rule, and very often the only item chargeable to public-health activities was a small salary of from \$2 to \$500 paid to the local health officer. In Warwood, W. Va., bids are received for the position of health officer, and at the time of survey the incumbent of this position was being paid \$1,200 per annum. In more than 40 of the total communities of under 5,000 population surveyed there was reported to be no organization for public-health work. Others made no appropriation for the health department. Many health officers received no salaries or only small fees for certain services.

Group 2, with populations from 5,000 to 10,000, shows but slightly better conditions. Per capita expenditures varied from 0.8 cents to 48.8 cents, with the majority near the group average of 12 cents. Salaries for health officers show but little advance over the previous group.

In group 3 the average community has a population of 14,000 and expends 16.8 cents per capita for public-health work. In this group the per capita expenditures varied from 1.8 cents to 61.5 cents. In 28 instances the expense of garbage or waste disposal was credited to the gross appropriation for the health department. There are a number of progressive communities in this group with fairly well organized public-health work, with a few fairly efficient full-time health officers, receiving fair salaries. The average for the group, however, is low.

Group 4 shows some improvement over the preceding groups, having an average city of 22,090 population, with a per capita expenditure of 20.6 cents. Health departments are somewhat better organized, with a few good examples of efficient organization, such as Montclair, N. J., and Asheville, N. C. Per capita figures for this group vary from 2.4 cents to 52.3 cents.

Group 5 shows still further improvement, with more examples of well-organized health departments. The average city has a population of 34,383 and a per capita expenditure of 24.6 cents, varying from 4.7 for Central Falls, R. I., to 46.7 for Salem, Mass.

In group 6, the average city has a population of 69,279 and an average per capita expenditure of 25.7 cents, with variations from 13.4 cents to 46.5 cents. In respect to per capita expenditures and average sanitary ratings, this group shows only slight advance over the previous group.

Group 7, with an average city of 138,431 population, shows considerable progress over the preceding group, having a per capita expenditure varying from 10.4 cents to 74.9 cents, with an average of 39.1 cents. Health departments in this group are, as a rule, fairly well organized and efficient, and their functions more varied. Full-time health officers are the rule.

#### Average Expenditures and Sanitary Ratings.

In attempting to compare the findings in the cities covered by the sanitary surveys made as a part of the stream pollution investigations a uniform method of rating was devised and adopted and the various factors responsible for the existing prevalence of typhoid fever were given certain fixed weighted ratings which were applied to percentage ratings as determined for the conditions found to exist. The sum of these weighted ratings was taken as the total sanitary rating for the community in question. After considerable experience in this method of rating communities, it was found that there existed a very close correlation between the sanitary ratings given and the average typhoid death rates, so that the conclusion seems warranted that the sanitary ratings given are reasonably accurate indices of the general sanitary status of the communities with respect to typhoid prevalence.

In Table 1 the average sanitary ratings for the groups are given. It is quite apparent that these average group ratings vary directly with the average group per capita expenditures, as might well be expected. The correlation here between the sanitary ratings and the average per capita expenditures is fairly consistent, the larger cities with larger per capita expenditures showing a higher average sanitary rating.

The average per capita expenditure for the 330 communities in Table 1 is 27.2 cents, varying from 9.1 to 39.1 cents. General consensus of opinion places the expenditure necessary for satisfactory public health activities in a community at about 50 cents per capita. The average city in the groups studied, therefore, is expending only slightly more than one-half the amount that is considered reasonable for the control of health hazards. And for the average expenditure of 27.2 cents, we find an average sanitary rating of only 66.7 out of a possible 100 per cent. Group 7 with an average expenditure of 39.1 cents annually, gets an average sanitary rating of 80.8. Under efficient management it might seem reasonable to expect that an expenditure of about 50 cents per capita annually would raise the sanitary rating of the group to a point above 90 and result in a marked reduction in sickness and a saving of lives, a worthy return on the investment.

### **Average Expenditures and Typhoid Death Rates.**

The last column in Table 1 gives the average typhoid death rates per 100,000 for the groups studied. Here, too, is found a reasonably close correlation between per capita expenditures and average death rates from typhoid fever, the latter being accepted as one of the important indices of the sanitary status of a community. The death rates given vary generally indirectly with the per capita expenditures and the sanitary ratings. In larger groups this correlation would undoubtedly tend to develop a better coefficient.

Comparing average per capita expenditures with average typhoid death rates in the communities studied, evidence is quite convincing that the smaller communities with meager appropriations for health purposes may usually expect relatively high typhoid death rates.

In dealing individually with the small community, the remedy for these unsatisfactory conditions may seem beyond the reach of public finances, but the success of the cooperative plan of public health administration seems assured by the attempts already made in a number of localities to pool interests in public health matters on a cooperative basis. In establishing civil sanitary districts around our National Army cantonments this cooperative plan has been adopted in a number of instances with every assurance of success. In smaller communities and in the rural districts cooperation between adjoining civil units in public health work will make possible a more efficient public health organization.

### **Health Officers Generally Poorly Paid.**

Table 2 emphasizes the fact that health officers are not highly paid public servants. The traditional tendency has been to appoint to these positions men from the medical profession who, from their knowledge of the diagnosis and treatment of disease in the individual, have been considered thereby competent to assume the responsibilities of safeguarding the health of the public at large. The majority of these health officers are busy practitioners of medicine who can and do give only a relatively small proportion of their time to their public health duties.

Having in mind the prevention and control of communicable disease, the chief business of a health department, opinion may be divided in the selection of the executive head of the department between the skilled medical graduate and the nonmedical but trained sanitarian. In any careful selection of an executive health officer the efficiency of the individual chosen depends largely upon whether he serves on a full-time or only a part-time basis. Part-time, poorly-paid, untrained, inexperienced, and often disinterested health officers can not be expected to establish any record for efficiency in public health work.

### Summary.

While it is difficult to compare the appropriations or expenditures of various health departments without a close study of the itemized statements of each community, it is believed that the data given in Table 1 give a fairly accurate and reasonable approximation of actual conditions existing to-day in average cities in the Ohio Valley and the Northeastern States.

Lack of uniformity in published statements and functions assumed by different health departments has been emphasized. Standard forms for published reports should be adopted, and fiscal-year periods might be made uniform.

The functions assumed by health departments vary to a large degree, it is believed, because of an absence of public sentiment and of knowledge necessary to properly appreciate the need for the control of health hazards. Appropriations generally are too meager, and health officers too often poorly paid, untrained, and unskilled in the fundamentals of preventive medicine and hygiene. Consequently much energy is wasted or misdirected, even though intentions are good, and satisfactory returns are not produced for even the small appropriations made available.

Public health activities in small communities are generally neglected and health organizations in these communities are too often inadequate, inefficient, and but poorly paid. On an average, the small community shows a relatively small expenditure for public health work, a low sanitary rating, and a high death rate from typhoid fever as well as from other preventable diseases. The value of measures necessary for the reduction of sickness and deaths from the common preventable diseases seems to be but poorly appreciated when municipal appropriations for the control of health hazards are compared with those for police and fire protection, even in smaller communities.

The general conclusion to be drawn from the tables presented is that appropriations for health departments in the United States vary quite directly with the size of the community and are in general insufficient for proper functioning of these departments. Consequently, municipal health officials and their assistants are too frequently underpaid, the salaries made available for responsible positions are too often insufficient to attract efficient and trained men, health activities are poorly organized and administered, the sanitary status of the community remains low, and the death rate from preventable diseases continues high.

The remedy for this condition of affairs is to be found in a measure in a more general education in the science of preventive medicine and hygiene. Now, if never before, the population should be kept physically fit and free from disease, and particularly the workers.